HIGH SCHOOL AND UNIVERSITY
MATRICULATION EXAMINATIONS BOARD.

DEPARTMENTAL EXAMINATIONS, 1928.

PHYSICS 2.

Time—Three hours.

Values.

3 **1.** (*a*) Deduce the formula: $S = ut + \frac{1}{2} gt^2$.

4 (*b*) Describe an experiment to prove the accuracy of the formula in (*a*).

6 (*c*) A body, thrown vertically upward, passes a point 173 ft. from the point of projection with a velocity of 50 feet per second. How much farther will it go, and what was the velocity with which it was projected?

4 **2.** *Either* (*a*) Define dyne, erg, watt and poundal as units of measurement.

4 (*b*) Prove that the pressure of a stream of liquid upon a surface is directly proportional to the square of the velocity with which the stream is moving.

4 (*c*) A rifle weighs 8 pounds and a bullet weighing 1 ounce leaves it with a velocity of 1500 ft. per sec. Find the velocity with which the rifle recoils.

4 *Or* (*a*) Give an experimental proof of the Parallelogram of Forces.

8 (*b*) Calculate the lifting force and also the resistance to horizontal motion of an airplane of area 260 sq. ft. travelling at 42 miles per hour and inclined at 30° to the horizontal.

Density of air .0025 pounds per cu. ft.,

$\sin 30^\circ = \frac{1}{2}$, $\cos 30^\circ = \frac{\sqrt{3}}{2}$.

3. (*a*) Two men have to remove a block of stone weighing 270 pounds by means of a plank 6 feet long, that weighs 20 pounds. How must the stone be placed on the plank to allow the one man to carry 180 pounds?

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Values.

6 (*b*) A body, the weight of which is 100 pounds, rests on a smooth plane inclined to the horizon at an angle of 30°. What horizontal force will keep the body at rest? What will be the pressure on the plane?

4 **4.** (*a*) State the *four* laws governing the friction between two surfaces in contact.

4 (*b*) Explain how to find the coefficient of friction between two surfaces.

Either

4 (*c*) A mass of 15 pounds rests on a rough horizontal plane. If the coefficient of friction is 0.25, find the least horizontal force which will move the mass.

6 (*a*) Using a diagram, explain the construction and mechanical advantage of a differential pulley.

Or

6 (*b*) Using a diagram, explain the action of the differential of a motor car.

5 **5.** (*a*) Describe an experimental demonstration of the Principle of Archimedes.

5 *Either* (*b*) The water in a canal lock rises to a height of 10 feet against one side of a vertical flood gate whose breadth is 12 feet. Find the total force of the water against the gate.

5 (*a*) A wooden block whose mass is 12 grams has a sinker attached to it and the two together displace 60 ccm. of oil. The sinker displaces 12 ccm. What is the density of the material in the block?

5 *Or* (*b*) What is the carrying capacity of an airship having a volume of 2500 cu.m. and a weight of 100 Kgm. when filled with hydrogen gas, the density of which is 0.0000895 gm. per ccm. while that of air is 0.001293 gm. per ccm.?

5 **6.** (*a*) Describe and explain the action of a good exhaustion air pump.

Either

5 (*b*) Using a diagram, explain the action of a double acting force pump.

Values.

6 (*a*) Give a mathematical demonstration of the fact that the height to which a liquid is drawn up in a capillary tube is inversely proportional to the radius of the bore of the tube.

Or

4 (*b*) Show how the principle of surface tension is applicable in the art of dyeing cloth.

5 **7.** (*a*) Prove that the velocity of flow of a perfect liquid through an orifice in a vessel is the same as that acquired by the liquid falling through the distance the orifice is below the free surface.

2 (*b*) What practical limitation applies in the operation of this principle?

6 **8.** (*a*) What is Bernoulli's Principle?

6 (*b*) Describe in detail a practical application of Bernoulli's Principle.

6 **9.** (*a*) Describe a device for determining the mechanical equivalent of heat.

2 (*b*) Define the terms "coulomb" and "joule" as used in electrical measurements.

4 (*c*) What is the maximum earning capacity of a generator (dynamo) delivering 500 amperes of current at 12,000 volts sold at $14.50 per horse power? (1 H.P. = 746 watts.)

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